

**METHOD FOR ETCHING A QUARTZ LAYER IN A  
PHOTORESISTLESS SEMICONDUCTOR MASK**

Abstract of the Disclosure

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A chromeless phase lithography mask (30) that does not require photoresist to manufacture has a quartz substrate (32) is etched by using a plasma (38) containing one of a nitrogen augmented hydro-fluorocarbon oxygen mixture and a nitrogen augmented fluorocarbon oxygen mixture. Various  
10 hydro-fluorocarbons or fluorocarbons may be used. The nitrogen addition results in etched openings in the quartz substrate that have substantially vertical sidewalls in a uniform manner across the substrate. Surface roughness is minimized and edges of the openings are well-defined with minimal rounding. The etch rate is rendered controllable by reducing bias power without degrading  
15 a desired vertical sidewall profile.